

**UNITED STATES PATENT APPLICATION**

**OF**

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**FOR**

**WASHING MACHINE**

[0001] This application claims the benefit of Korean Application(s) No. 10-2002-0075021 filed on November 28, 2002, which is/are hereby incorporated by reference.

## BACKGROUND OF THE INVENTION

### Field of the Invention

[0002] The present invention relates to a washing machine, and more particularly, to a tub of a washing machine.

### Discussion of the Related Art

[0003] Generally, a washing machine includes a tub and a drum installed in the tub. The tub preliminarily holds water therein and the drum is supplied with the water from the tub together with a detergent.

[0004] A laundry is washed by a chemical reaction between the water and the detergent as well as a mechanical shock by a rotation of the drum. The laundry is rinsed to eliminate the detergent and filth remaining after washing, and is then dewatered. Moreover, in order to increase a washing efficiency, the water can be heated in the tub to be supplied to the drum.

[0005] However, during such a washing step, water is generated from temperature difference from a surrounding or leaks from parts of the washing machine. Such water may penetrate into the electric devices of the washing machine, whereby failure or malfunction of the electric devices may take place. Moreover, an electric shock or fire may be brought about by short circuit or the like.

## SUMMARY OF THE INVENTION

[0006] Accordingly, the present invention is directed to a washing machine that

substantially obviates one or more of the problems due to limitations and disadvantages of the related art.

[0007] An object of the present invention, which has been devised to solve the foregoing problem, lies in providing a washing machine, by which water is prevented from  
5 flowing in inner electric parts of the washing machine.

[0008] Additional features and advantages of the invention will be set forth in the description which follows, and in part will be apparent to those having ordinary skill in the art upon examination of the following or may be learned from a practice of the invention. The objectives and other advantages of the invention will be realized and attained by the subject  
10 matter particularly pointed out in the specification and claims hereof as well as in the appended drawings.

[0009] To achieve these objects and other advantages in accordance with the present invention, as embodied and broadly described herein, there is provided a washing machine including a housing, a tub in the housing, a drum rotatably installed in the tub to hold a  
15 laundry, and a protecting member provided at the tub to prevent water from accessing an electric apparatus installed at the tub.

[0010] In such a washing machine, the protecting member is formed to cut off the water accessing the electric apparatus. Preferably, the protecting member guides the water to detour the electric apparatus. For this, more preferably, the protecting member encloses the  
20 electric apparatus in part at least and substantially includes at least one rib provided in a vicinity of the electric apparatus.

[0011] The protecting member includes a first rib preventing the water from accessing a motor installed at the tub. The first rib is preferably provided in a vicinity of the motor. More preferably, the first rib is disposed over the motor and has a predetermined

curvature.

[0012] Moreover, the protecting member includes a second rib preventing the water from accessing a heater installed in the tub. Preferably, the second tub is provided in a vicinity of a terminal for supplying power to the heater. More preferably, the second rib is provided in  
5 a vicinity of right and left sides of the terminal.

[0013] Therefore, the water is prevented from accessing the electric devices of the washing machine, whereby failure or malfunction of the electric devices are prevented.

[0014] It is to be understood that both the foregoing explanation and the following detailed description of the present invention are exemplary and illustrative and are intended to  
10 provide further explanation of the invention as claimed.

#### BRIEF DESCRIPTION OF THE DRAWINGS

[0015] The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this application, illustrate embodiment(s) of the invention and together with the description serve to explain  
15 the principle of the invention. In the drawings:

[0016] FIG. 1 is a perspective view of a washing machine according to the present invention;

[0017] FIG. 2 is a cross-sectional view of a washing machine according to the present  
20 invention;

[0018] FIG. 3 is a rear view of a tub of a washing machine according to the present invention; and

[0019] FIG. 4 is a front view of a tub of a washing machine according to the present invention.

## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT(S)

[0020] Reference will now be made in detail to the preferred embodiment(s) of the present invention, examples of which are illustrated in the accompanying drawings.

5 Throughout the drawings, like elements are indicated using the same or similar reference designations where possible.

[0021] FIG. 1 is a perspective view of a washing machine according to the present invention and FIG. 2 is a cross-sectional view of a washing machine according to the present invention. The washing machine shown in FIG. 1 and FIG. 2 adopts a front loading type but is  
10 as good as a top loading type washing machine except that a tub 20 and a drum 30 are horizontally installed. For convenience of explanation, the present invention is described for the front loading type washing machine but is applicable to the top loading type washing machine in the same manner.

[0022] Referring to FIG. 1 and FIG. 2, a washing machine according to the present  
15 invention includes a housing 10, a tub 20 installed in the housing 10, and a drum 30 in the tub 20.

[0023] The housing 10 is designed to hold various parts of the washing machine inside to protect. A door 11 is installed at a front side of the housing 10 to open/close an entrance 10a communicating with the drum 30, and a control panel 12 is installed on the  
20 housing 10. A user uses the control panel 12 to direct an operation of the washing machine and loads a laundry in/from the drum 30 via the door 11.

[0024] The tub 20 preliminarily holds water to supply the water to the drum 30 uniformly. The tub 20 is elastically installed in the housing 10 using dampers 13a and 13b. A penetration hole 20a is formed at a bottom center of the tub 20, and a driving shaft 40b is

installed through the penetration hole 20a to be connected to the drum 30. Moreover, a plurality of ribs 20c are formed on a rear side of the tub 20 to enhance a rigidity of the tub 20.

[0025] The drum 30 holds a laundry 30 and is rotatably installed in the tub 20. And, the drum 30 includes a multitude of perforated holes 30a to make the water flow in from the tub 20. Moreover, a plurality of baffles 30b are attached to an inner circumference of the drum 30 to mix the laundry well.

[0026] A motor 40 is installed at the rear side of the tub 20 to provide a dynamic force for a rotation of the drum 30. Specifically, the motor 40 includes a stator 41 and a rotor 42 enclosing the stator 41. The stator 42 is installed at the rear side of the tub 20 using a bracket 40a. And, the stator 42 includes a core 41a and a core tooth 41b extending from the core 41a to have a winding coil. The rotor 42 is coupled with the driving shaft 40b, and includes a frame 42a and a magnet 42b loaded on an inner circumference of the frame 42a. And, the rotor 42 rotates by an electromagnetic force generated between the stator 41 and itself so as to rotate the driving shaft and drum 40b and 30 connected to each other.

[0027] Moreover, in the washing machine, installed are a water supply equipment 50 for supplying the water to the tub 20 and a drain equipment 60 for discharging the used water. The drain equipment 50 includes a water supply pipe 51, a valve 52 provided in the water supply pipe 51, and a detergent box 53. The water supply pipe 51 is connected to the tub 20 and extends through the housing 10 to be connected to an external water supply source. The valve 52 selectively opens or closes the water supply valve 51, and the detergent box 53 holds a predetermined amount of a detergent therein. Hence, once the valve 52 is turned on, the water follows the water supply pipe 51 from the water supply source to be supplied to the tub 20 together with the detergent via the detergent box 53. Moreover, the drain equipment 60 includes a first drainpipe 61, a pump 62, and a second drainpipe 63. Specifically, the first

drainpipe 61 is connected to the tub 20 and the pump 62 and the second drainpipe 63 is connected to the pump 62 to extend outside the washing machine through the housing 10.

[0028] Since the pump 62 substantially controls a discharge of the water, the supplied water is always held in the first drainpipe 61 before being discharged. After completion of a washing step, once the pump 62 operates, the used water is discharged outside via the first and second drainpipes 61 and 63. A control equipment 12a is installed inside the control panel 12 and is electrically connected to various equipments 40, 50, and 60. The control equipment 12a receives a user's direction as an electric signal through the control panel 12 and controls operations of the respective equipments 40, 50, and 60 according to such a direction.

[0029] Meanwhile, warm or hot water is needed according to a kind or state of a laundry. Hence, a heater 70 is included in the washing machine to provide the warm or hot water by itself. The heater 70, as shown in FIG. 2, is installed at the tub 20 to heat the water held in the tub 20 up to a demanded temperature to supply the heated water to the drum 30. The heater 70 is arranged in a cavity 20b formed in the tub 20, and includes a heating body 71 and a terminal 72. The heating body 71 is substantially disposed in the tub 20, and more precisely, in the cavity 20b to generate heat for heating the water. For this, various heating mechanisms are applicable to the heating body 71. And, the heating body 71 is generally formed of a hot wire. The terminal 72 is electrically connected to a tip of the heating body 71. And, the terminal 72 is disposed outside the tub 20 to be connected to an external power source via a wire to supply electricity to the heating body 71.

[0030] While the above-constructed washing machine operates, water contents are condensed on an outer circumference of the tub 20 or an inside of the housing 10 due to a temperature difference to produce water (e.g., water drops). Specifically, when the water in the tub 20 is heated, the condensed water is mainly produced on the tub 20 and the housing 10.

Besides, the water may leak from the tub 20 or the water supply/drain equipments 50 and 60. Such water may flow along the outer circumference of the tub 20 or falls out of the housing to enter the various electric equipments. Specifically, since the electric equipments such as the motor 40 and the heater 70 are installed at the tub 20 to be exposed, it is highly probable that the water may penetrate into theses equipments. Hence, the present invention further provides a protecting member 100 for preventing the water from accessing the electric equipments 40 and 40 and 70.

[0031] The protecting member 100 should basically cut off a water path accessible to the electric equipments 40 and 70 to prevent the access of the water. Moreover, in case that such water is excessively produced, it is more effective to guide the water to detour the electric parts in preventing the water access. To satisfy such a condition, the protecting member 100 needs to enclose the electric equipments 40 and 70 in part at least. Hence, the present invention provides at least one rib in the vicinity of the electric equipments 40 and 70 as an optimal protecting member 100. Such a protecting member 100 is explained in detail by referring to FIG. 2 to FIG. 4 as follows.

[0032] First of all, the protecting member 100, as shown in FIG. 2 and FIG. 3, includes a first rib 110 preventing the water from accessing the motor 40. The first rib 110 is provided in the vicinity of the motor 40 mounted on the rear side of the tub 20. Specifically, the first rib 110 protrudes from the rear side of the tub 10 in the vicinity of the motor 40. Namely, the first rib 110 is formed to enclose the motor 40. As mentioned in the foregoing description, the water flows downward along the rear side of the tub 20 and falls toward the motor 40 from a top panel of the housing 10. Hence, in order to cut off the water, the first rib 110 is disposed over the motor 40. Preferably, the first rib 110 has a predetermined curvature so that the water detours the motor 40 along the curved first rib 110 more smoothly. Moreover,



in order not to interrupt the rotational movement of the motor 40, the first rib 110 should leave a predetermined gap from the motor 40. Hence, the water is guided by the first rib 110 to flow and then falls down on the bottom of the housing 10 from the first rib 110. Such a first rib 110 may be built in one body of the rear side of the tub 20 or be installed at the rear side of the tub  
5 20 as a separate member.

[0033] The protecting member 100, as shown in FIG. 2 and FIG. 4, further includes a second rib 120 to prevent the water from accessing the heater 70. The second rib 120 is provided in the vicinity of the heater 70 installed at a sidewall of the tub 20. As mentioned in the foregoing description of the heater 70, the heating body 71 is inserted in the tub 20 but the  
10 terminal 72 is exposed only. Hence, the second rib 120 is provided in the vicinity of the terminal 72 only. Specifically, the second rib 120 protrudes from the outer circumference of the tub 20 to enclose the terminal 72. In order to cut off the water flowing along the outer circumference of the tub 20 more securely, a pair of second ribs 120 and 120b, as shown in FIG. 4, are preferably provided near right and left sides of the terminal 72. Moreover, a pair  
15 of the second ribs 120a and 120b downwardly extend in parallel. Hence, the water on the tub 20 is guided by the second ribs 120a and 120b to detour the terminal 72, and then finally falls on the bottom of the housing 10 from the second ribs 120a and 120b. Like the first rib 110, the second rib 120 can be built in one body of the sidewall of the tub 20 or be installed at the sidewall of the tub 20 as a separate member.

20 [0034] Accordingly, the present invention has the following advantages or effects.

[0035] First of all, the present invention provides the protecting member to the electric equipments installed at the tub, and more particularly, to the motor and the heater so that the water produced in the washing machine is guided to detour the electric equipments. Therefore, the protecting member prevents the water from accessing the electric equipments,

whereby failure or malfunction of the electric equipments is prevented. Furthermore, the protecting member enables to prevent the electric shock or fire. Therefore, the washing machine according to the present invention enables to provide enhanced stability and reliance.

**[0036]** It will be apparent to those skilled in the art that various modifications and  
5 variations can be made in the present invention without departing from the spirit or scope of the invention. Thus, it is intended that the present invention cover such modifications and variations, provided they come within the scope of the appended claims and their equivalents.

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